



Analytical Laboratory

Page 1 of 18

13339 Hagers Ferry Road
Huntersville, NC 28078-7929
McGuire Nuclear Complex - MG03A2
Phone: 980-875-5245 Fax: 980-875-4349

Order Summary Report

Order Number: J13110223

Project Name:

Customer Name(s): Bill Kennedy, Wayne Chapman

Customer Address: 3195 Pine Hall Rd
Mailcode: Belews Steam Station
Belews Creek, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

Report Authorized By: _____ **Date:** 12/6/2013
(Signature) Jason C Perkins

Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013027767	BELEWS	13-Nov-13 7:30 AM	Matt C.	FGD Purge Eff
2013027768	BELEWS	13-Nov-13 7:45 AM	Matt C.	EQ Tank Eff
2013027769	BELEWS	13-Nov-13 7:50 AM	Matt C.	BIOREACTOR 1 INF
2013027770	BELEWS	13-Nov-13 7:55 AM	Matt C.	BioReactor 2 Inf
2013027771	BELEWS	13-Nov-13 8:00 AM	Matt C.	BioReactor 2 Eff
2013027773	BELEWS	13-Nov-13 8:30 AM	Matt C.	FILTER BLANK
2013027774	BELEWS	31-Oct-13 2:10 PM	D. Baker	METALS TRIP BLANK
7 Total Samples				

Technical Validation Review

Checklist:

- | | | |
|--|---|--|
| COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures). | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |
| All Results are less than the laboratory reporting limits. | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| All laboratory QA/QC requirements are acceptable. | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No |

Report Sections Included:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Job Summary Report | <input checked="" type="checkbox"/> Sub-contracted Laboratory Results |
| <input checked="" type="checkbox"/> Sample Identification | <input type="checkbox"/> Customer Specific Data Sheets, Reports, & Documentation |
| <input checked="" type="checkbox"/> Technical Validation of Data Package | <input type="checkbox"/> Customer Database Entries |
| <input checked="" type="checkbox"/> Analytical Laboratory Certificate of Analysis | <input checked="" type="checkbox"/> Chain of Custody |
| <input type="checkbox"/> Analytical Laboratory QC Report | <input checked="" type="checkbox"/> Electronic Data Deliverable (EDD) Sent Separatel |

Reviewed By: DBA Account

Date: 12/6/2013

Certificate of Laboratory Analysis

Page 4 of 18

*This report shall not be reproduced, except in full.***Order # J13110223**

Site: FGD Purge Eff

Collection Date: 13-Nov-13 7:30 AM

Sample #: 2013027767

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>INORGANIC IONS BY IC</u>								
Bromide	77	mg/L		5	50	EPA 300.0	11/22/2013 13:34	JAHERMA
Chloride	6700	mg/L		100	1000	EPA 300.0	11/22/2013 13:34	JAHERMA
<u>MERCURY (COLD VAPOR) IN WATER</u>								
Mercury (Hg)	147	ug/L		5	100	EPA 245.1	11/26/2013 12:42	DKJOHN2
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	225	mg/L		0.5	10	EPA 200.7	11/19/2013 16:14	SLS2560
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	933	ug/L		10	10	EPA 200.8	11/26/2013 14:11	DJSULL1
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	193	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
Chromium (Cr)	297	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
Copper (Cu)	122	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
Nickel (Ni)	240	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
Selenium (Se)	2830	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
Thallium (Tl)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
Vanadium (V)	202	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
Zinc (Zn)	233	ug/L		10	10	EPA 200.8	12/04/2013 13:33	DJSULL1
<u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete					Vendor Method	V_AS&C	
<u>TOTAL DISSOLVED SOLIDS</u>								
TDS	23000	mg/L		250	1	SM2540C	11/20/2013 14:13	DSBAKE1
<u>TOTAL SUSPENDED SOLIDS</u>								
TSS	3000	mg/L		250	1	SM2540D	11/15/2013 13:30	TJA7067

Site: EQ Tank Eff

Collection Date: 13-Nov-13 7:45 AM

Sample #: 2013027768

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>MERCURY (COLD VAPOR) IN WATER</u>								
Mercury (Hg)	157	ug/L		2.5	50	EPA 245.1	11/26/2013 12:45	DKJOHN2
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	236	mg/L		0.5	10	EPA 200.7	11/19/2013 16:18	SLS2560

Certificate of Laboratory Analysis

Page 5 of 18

*This report shall not be reproduced, except in full.***Order # J13110223**

Site: EQ Tank Eff

Collection Date: 13-Nov-13 7:45 AM

Sample #: 2013027768

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	486	ug/L		10	10	EPA 200.8	11/26/2013 14:14	DJSULL1
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	230	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1
Chromium (Cr)	366	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1
Copper (Cu)	153	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1
Nickel (Ni)	263	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1
Selenium (Se)	3290	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1
Thallium (Tl)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1
Vanadium (V)	271	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1
Zinc (Zn)	281	ug/L		10	10	EPA 200.8	12/04/2013 13:36	DJSULL1

Site: BIOREACTOR 1 INF

Collection Date: 13-Nov-13 7:50 AM

Sample #: 2013027769

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>NITRITE + NITRATE (COLORIMETRIC)</u>								
Nitrite + Nitrate (Colorimetric)	7.7	mg-N/L		0.25	25	EPA 353.2	11/15/2013 11:46	BGN9034
<u>INORGANIC IONS BY IC</u>								
Bromide	75	mg/L		5	50	EPA 300.0	11/22/2013 13:53	JAHERMA
Chloride	6800	mg/L		100	1000	EPA 300.0	11/22/2013 13:53	JAHERMA
<u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	213	mg/L		0.5	10	EPA 200.7	11/19/2013 16:22	SLS2560
<u>DISSOLVED METALS BY ICP-MS</u>								
Selenium (Se)	549	ug/L		10	10	EPA 200.8	11/26/2013 14:17	DJSULL1

Certificate of Laboratory Analysis

Page 6 of 18

*This report shall not be reproduced, except in full.***Order # J13110223**

Site: BIOREACTOR 1 INF

Collection Date: 13-Nov-13 7:50 AM

Sample #: 2013027769

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1
Nickel (Ni)	12.6	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1
Selenium (Se)	561	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1
Thallium (Tl)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1
Vanadium (V)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:40	DJSULL1

SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)

Vendor Parameter	Complete	Vendor Method	V_AS&C
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TOTAL DISSOLVED SOLIDS

TDS	15000	mg/L	25	1	SM2540C	11/20/2013 14:13	DSBAKE1
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TOTAL SUSPENDED SOLIDS

TSS	9.0	mg/L	5	1	SM2540D	11/15/2013 13:30	TJA7067
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Site: BioReactor 2 Inf

Collection Date: 13-Nov-13 7:55 AM

Sample #: 2013027770

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	209	mg/L		0.5	10	EPA 200.7	11/19/2013 16:26	SLS2560
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1
Nickel (Ni)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1
Selenium (Se)	20.4	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1
Thallium (Tl)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1
Vanadium (V)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	12/04/2013 13:43	DJSULL1

Certificate of Laboratory Analysis

Page 7 of 18

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Site: BioReactor 2 Inf

Collection Date: 13-Nov-13 7:55 AM

Sample #: 2013027770

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
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Site: BioReactor 2 Eff

Collection Date: 13-Nov-13 8:00 AM

Sample #: 2013027771

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
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NITRITE + NITRATE (COLORIMETRIC)

Nitrite + Nitrate (Colorimetric)	0.016	mg-N/L		0.01	1	EPA 353.2	11/15/2013 11:47	BGN9034
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INORGANIC IONS BY IC

Bromide	77	mg/L		5	50	EPA 300.0	11/22/2013 14:12	JAHERMA
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Chloride	6600	mg/L		100	1000	EPA 300.0	11/22/2013 14:12	JAHERMA
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Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)

Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
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TOTAL RECOVERABLE METALS BY ICP

Boron (B)	205	mg/L		0.5	10	EPA 200.7	11/19/2013 16:30	SLS2560
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TOTAL RECOVERABLE METALS BY ICP-MS

Arsenic (As)	< 5	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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Cadmium (Cd)	< 5	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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Chromium (Cr)	< 5	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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Copper (Cu)	< 5	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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Nickel (Ni)	< 5	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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Selenium (Se)	6.51	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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Silver (Ag)	< 5	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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Thallium (Tl)	< 5	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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Vanadium (V)	< 5	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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Zinc (Zn)	< 5	ug/L		5	5	EPA 200.8	12/04/2013 13:47	DJSULL1
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SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)

Vendor Parameter	Complete					Vendor Method		V_AS&C
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Site: FILTER BLANK

Collection Date: 13-Nov-13 8:30 AM

Sample #: 2013027773

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
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DISSOLVED METALS BY ICP-MS

Selenium (Se)	1.18	ug/L	B2	1	1	EPA 200.8	11/26/2013 13:56	DJSULL1
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Certificate of Laboratory Analysis

Page 8 of 18

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Order # J13110223

Site: METALS TRIP BLANK

Collection Date: 31-Oct-13 2:10 PM

Sample #: 2013027774

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<u>TOTAL RECOVERABLE METALS BY ICP</u>								
Boron (B)	< 0.05	mg/L		0.05	1	EPA 200.7	11/19/2013 16:06	SLS2560
<u>TOTAL RECOVERABLE METALS BY ICP-MS</u>								
Arsenic (As)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1
Cadmium (Cd)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1
Chromium (Cr)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1
Copper (Cu)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1
Nickel (Ni)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1
Selenium (Se)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1
Silver (Ag)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1
Thallium (Tl)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1
Vanadium (V)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1
Zinc (Zn)	< 1	ug/L		1	1	EPA 200.8	12/04/2013 13:26	DJSULL1

Qualifiers:

- B2** Target analyte was detected in blank(s) at a concentration greater than ½ the reporting limit but less than the reporting limit. Analyte concentration in sample is valid and may be used for compliance purposes.



**APPLIED SPECIATION
AND CONSULTING, LLC**

18804 Northcreek Parkway Bothell, WA, 98011
Tel: (425) 483-3300 Fax: (425) 483-9818
www.appliedspeciation.com

December 5, 2013

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078
(704) 875-5245

Project: Fontier Pilot (Belews Creek) WWTS (Weekly Sampling) (LIMS# J13110223)

Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for total mercury, hexavalent chromium, and selenium speciation analyses on November 14, 2013. The samples were received in a sealed cooler at -0.3°C on November 15, 2013. Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Hexavalent chromium analysis was performed via ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS). Selenium speciation analysis was performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Any issues associated with the analyses are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeremy Maute".

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins
Duke Energy Analytical Laboratory
Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd.
Huntersville, NC 28078

Project: Frontier Pilot (Belews Creek) WWTS (Weekly Sampling) (LIMS# J13110223)

December 5, 2013

1. Sample Reception

Three (3) aqueous samples were submitted for hexavalent chromium and selenium speciation analyses on November 14, 2013. Three (3) additional samples were submitted for total mercury quantitation. All samples were received in acceptable condition on November 15, 2013 in a sealed container at -0.3°C.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample submitted for hexavalent chromium analysis was filtered (0.45µm) and stored in a secure refrigerator maintained at a temperature of 4°C, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45µm) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of -80°C) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS).

2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Hexavalent Chromium Analysis by IC-ICP-DRC-MS Prior to analysis, all samples were injected directly into autosampler vials. No further sample preparation was performed as any chemical alteration of the samples may shift the equilibrium of the system resulting in changes in speciation ratios.

Selenium Speciation Analysis by IC-ICP-CRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45 μ m) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on November 18, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Hexavalent Chromium Analysis by IC-ICP-DRC-MS Each sample for hexavalent chromium analysis was analyzed by ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS) on December 5, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic (pH > 7) gradient. The

eluting chromium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (DRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

Selenium Speciation Analysis by IC-ICP-CRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS) on November 19, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic ($\text{pH} > 7$) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (CRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

4. Analytical Issues

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with these samples were within acceptance limits.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL values for methylseleninic acid and selenomethionine are calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL values for hexavalent chromium and mercury are calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Maute', with a stylized flourish extending to the right.

Jeremy Maute
Project Coordinator
Applied Speciation and Consulting, LLC

Total Mercury, Hexavalent Chromium, and Selenium Speciation Results for Duke Energy

Project Name: Frontier Pilot (Belews Creek) WWTS (Weekly Sampling)

Contact: Jay Perkins

LIMS #J13110223

Date: December 5, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

Sample Results

Sample ID	Total Hg	Cr(VI)	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	ND (< 1.1)	1450	23.3	3.0	ND (< 1.7)	ND (< 1.7)	3.6 (1)
BioReactor 1 Inf	0.0703	ND (< 1.1)	538	21.9	5.29	3.29	ND (< 0.43)	1.77 (1)
BioReactor 2 Inf	0.0124	NR	NR	NR	NR	NR	NR	NR
BioReactor 2 Eff	0.0054	ND (< 1.1)	ND (< 0.47)	ND (< 0.30)	ND (< 0.53)	ND (< 0.43)	ND (< 0.43)	0 (0)

All results reflect the applied dilution and are reported in µg/L

NR = Analysis not requested

ND = Not detected at the applied dilution

SeCN = Selenocyanate

MeSe(IV) = Methylseleninic acid

SeMe = Selenomethionine

Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS

n = number of unknown Se species observed

Total Mercury, Hexavalent Chromium, and Selenium Speciation Results for Duke Energy

Project Name: Fontier Pilot (Belews Creek) WWTS (Weekly Sampling)

Contact: Jay Perkins

LIMS #J13110223

Date: December 5, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

Quality Control Summary - Preparation Blank Summary

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 250x	eMDL 1000x
Hg	-0.0004	-0.0003	-0.0001	-0.0002	-0.0003	0.0001	0.0001	0.0004	-	-
Cr(VI)	-0.4	-1.0	-0.2	-0.2	-0.5	0.4	0.001	-	-	1.1
Se(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.47	1.9
Se(VI)	0.000	0.000	0.000	0.000	0.000	0.000	0.001	-	0.30	1.2
SeCN	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.53	2.1
MeSe(IV)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.43	1.7
SeMe	0.000	0.000	0.000	0.000	0.000	0.000	0.002	-	0.43	1.7

eMDL = Estimated Method Detection Limit

*Please see narrative regarding eMDL calculations

Quality Control Summary - Certified Reference Materials

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1626	103.7
Cr(VI)	LCS	1.000	1.161	116.1
Se(IV)	LCS	9.57	9.28	96.9
Se(VI)	LCS	9.48	9.22	97.3
SeCN	LCS	8.92	8.55	95.9
MeSe(IV)	LCS	6.47	6.23	96.3
SeMe	LCS	9.32	8.84	94.8

Total Mercury, Hexavalent Chromium, and Selenium Speciation Results for Duke Energy

Project Name: Frontier Pilot (Belews Creek) WWTS (Weekly Sampling)

Contact: Jay Perkins

LIMS #J13110223

Date: December 5, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

Quality Control Summary - Matrix Duplicates

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	BioReactor 2 Eff	0.0054	0.0053	0.0054	1.9
Cr(VI)	Batch QC	ND (< 1.1)	ND (< 1.1)	NC	NC
Se(IV)	Batch QC	ND (< 0.47)	ND (< 0.47)	NC	NC
Se(VI)	Batch QC	ND (< 0.30)	ND (< 0.30)	NC	NC
SeCN	Batch QC	ND (< 0.53)	ND (< 0.53)	NC	NC
MeSe(IV)	Batch QC	ND (< 0.43)	ND (< 0.43)	NC	NC
SeMe	Batch QC	ND (< 0.43)	ND (< 0.43)	NC	NC

ND = Not detected at the applied dilution

NC = Value was not calculated due to one or more concentrations below the eMDL

Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	BioReactor 2 Eff	2.000	2.106	105.0	2.000	2.119	105.7	0.6
Cr(VI)	Batch QC	1000	860.1	86.0	1000	845.7	84.6	1.7
Se(IV)	Batch QC	1390	1336	96.1	1390	1344	96.7	0.6
Se(VI)	Batch QC	1261	1176	93.3	1261	1190	94.3	1.1
SeCN	Batch QC	1144	1026	89.7	1144	1043	91.2	1.7

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM



Duke Energy Analytical Laboratory
 Mail Code MGO3A2 (Building 7405)
 13339 Hagers Ferry Rd
 Huntersville, N. C. 28078
 (704) 875-5245
 Fax: (704) 875-4349

1) Project Name: **Frontier Pilot (Belews Creek)**
 WWTs (Weekly Sampling)
 2) Client: **Bill Kennedy, Wayne Chapman**
 3) Business Unit: **20006**
 4) Process: **SFHDW1205**
 5) Oper. Unit: **FHGO**
 6) Res. Type: **3500**
 7) Mail Code: **1830000**

LAB USE ONLY

11) Lab ID: 241302-7767
 241302-7768
 241302-7769
 241302-7770
 241302-7771
 241302-7772
 241302-7773
 241302-7774

13) Sample Description or ID

Se Speciation Bottle ID

FGD Purge Eff
 EQ Tank Eff.
 BioReactor 1 Inf
 BioReactor 2 Inf
 BioReactor 2 Eff
 Bio Pilot Eff
 mF Pilot Eff
 Filter Blk
 Metals Trip Blk

Customer to complete all appropriate non-shaded areas.

Sampling conducted: Every Wednesday

16) Analyses Required

17) Comp. 18) Grab

19) Preserv.: 1=HCl, 2=H₂SO₄, 3=HNO₃, 4=lce, 5=None

1) Date 2) Time 3) Signature

11/13 0730 Matt Campbell
 11/13 0745 Matt Campbell
 11/13 0750 Matt Campbell
 11/13 0755 Matt Campbell
 11/13 0800 Matt Campbell
 11/13 - offline
 11/13 - offline
 11/13 0830 Matt Campbell
 11/13 1410 D. Bick

4) Br, Cl (Dionex) 5) Metals* + Hg** 6) Se (IMS), filtered 7) Hg 200.8 (V-AS&C) 8) Nitrate

9) 1 10) 1 11) 1 12) 1 13) 1 14) 1 15) 1 16) 1 17) 1 18) 1 19) 1 20) 1 21) 1 22) 1 23) 1 24) 1 25) 1 26) 1 27) 1 28) 1 29) 1 30) 1 31) 1 32) 1 33) 1 34) 1 35) 1 36) 1 37) 1 38) 1 39) 1 40) 1 41) 1 42) 1 43) 1 44) 1 45) 1 46) 1 47) 1 48) 1 49) 1 50) 1 51) 1 52) 1 53) 1 54) 1 55) 1 56) 1 57) 1 58) 1 59) 1 60) 1 61) 1 62) 1 63) 1 64) 1 65) 1 66) 1 67) 1 68) 1 69) 1 70) 1 71) 1 72) 1 73) 1 74) 1 75) 1 76) 1 77) 1 78) 1 79) 1 80) 1 81) 1 82) 1 83) 1 84) 1 85) 1 86) 1 87) 1 88) 1 89) 1 90) 1 91) 1 92) 1 93) 1 94) 1 95) 1 96) 1 97) 1 98) 1 99) 1 100) 1

Customer to sign & date below - fill out from left to right.

1) Relinquished By: **Matt Campbell** Date/Time: **11/13/13 1310**
 2) Accepted By: **[Signature]** Date/Time: **11/14/13 1400**
 3) Relinquished By: **[Signature]** Date/Time: **11/14/13 1315**
 4) Accepted By: **[Signature]** Date/Time: **11/15/13 9:45**
 5) Relinquished By: **[Signature]** Date/Time: **11/15/13 9:45**
 6) Accepted By: **[Signature]** Date/Time: **11/15/13 9:45**
 7) Relinquished By: **[Signature]** Date/Time: **11/15/13 9:45**
 8) Accepted By: **[Signature]** Date/Time: **11/15/13 9:45**
 9) Seal/Locked By: **[Signature]** Date/Time: **11/15/13 9:45**
 10) Seal/Locked By: **[Signature]** Date/Time: **11/15/13 9:45**
 11) Seal/Locked By: **[Signature]** Date/Time: **11/15/13 9:45**
 12) Seal/Locked By: **[Signature]** Date/Time: **11/15/13 9:45**

Comments: *** B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn, V, Ti by TRM/IMS 1**=No Hg**

19) Page 1 of 2
 DISTRIBUTION
 ORIGINAL TO LAB,
 COPY TO CLIENT

ORDER# **J13110223**
 Logged By: **[Signature]** Date and Time: **11/13/13 1400**

MATRIX: OTHER
 Samples Originating From: **NC**
 SAMPLE PROGRAM: **Ground Water**
 Water: **Drinking Water**
 NPOES: **UST**
 RCRA Waste: **4**

AS&C
 PO #650910



Duke Energy Analytical Laboratory

Mail Code MGO3A2 (Building 7405)
13339 Hagers Ferry Rd
Huntersville, N. C. 28078
(704) 875-5245
Fax: (704) 875-4349

1) Project Name Frontier Pilot (Belews Creek) WWTS (Weekly Sampling)		2) Phone No:	
2) Client: Bill Kennedy, Wayne Chapman		4) Fax No:	
5) Business Unit: 20006	6) Process: SFHDW1205	Mail Code:	
8) Oper. Unit: FHGO	9) Res. Type: 3500	10) Reso. Center: 1830000	

Analytical Laboratory Use Only			
ORDER# J13118223	MATRIX: OTHER	Samples Originating From	NC SC
Logged By	Date & Time	SAMPLE PROGRAM Water _____ Ground NPDES Drinking Water UST RCRA Waste	
AS&C PO #650910		Cooler Temp (C) 5.6	
15 Preserv.: 1=HCL 2=H ₂ SO ₄ 3=HNO ₃ 4=Ice 5=None		4	

19 Page 1 of 2
DISTRIBUTION Page 18 of 18
ORIGINAL to LAB,
COPY to CLIENT

Customer to complete all
appropriate non-shaded areas.

Sampling conducted: Every Wednesday

Se Speciation Bottle ID	13 Sample Description or ID	Date	Time	Signature	17 Comp.	18 Grab	TDS, TSS	Br, Cl (Dionex)	Metals* + Hg**	Se (IMS), filtered	Hg 200.8 (V_AS&C)	Nitrate	Cr, Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)
	FGD Purge Eff	11/13	0730	Matt Campbell			1	1	1	1			1
	EQ Tank Eff.	11/13	0745	Matt Campbell					1	1			
	BioReactor 1 Inf	11/13	0750	Matt Campbell			1	1	1**	1	1	1	1
	BioReactor 2 Inf	11/13	0755	Matt Campbell					1**		1		
	BioReactor 2 Eff	11/13	0800	Matt Campbell				1	1**		1	1	1
	Bio Pilot Eff	11/13	-	Offline					1**	1	1	1	1
	mF Pilot Eff	11/13	-	Offline			1	1	1**	1	1	1	1
	Filter Blk	11/13	0830	Matt Campbell						1			
	Metals Trip Blk	10/31/13	1410	D. Bel					1**				
Filtering of the Se is performed in the field please provide a filter blank too.													

Customer to sign & date below - fill out from left to right.

1) Relinquished By <i>Matt Campbell</i>	Date/Time 11/13/13 1310	2) Accepted By <i>[Signature]</i>	Date/Time 11/14/13 940
3) Relinquished By <i>[Signature]</i>	Date/Time 11/14/13 1215	4) Accepted By <i>[Signature]</i>	Date/Time
5) Relinquished By	Date/Time	6) Accepted By:	Date/Time
7) Relinquished By	Date/Time	8) Accepted By:	Date/Time
9) Seal/Locked By	Date/Time	10) Seal/Lock Opened By <i>[Signature]</i>	Date/Time 11/14/13 94A
11) Seal/Locked By	Date/Time	12) Seal/Lock Opened By	Date/Time
Comments * B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn, V, Ti by TRM/IMS 1**=No Hg			

Customer, IMPORTANT!
Please indicate desired turnaround.

22 Requested Turnaround

14 Days _____

*7 Days _____

*48 Hr _____

*Other _____

* Add. Cost Will Apply

Customer must complete

Customer to complete appropriate columns to right

LAB USE ONLY

11 Lab ID

201 302 7767

201 302 7768

201 302 7769

201 302 7770

201 302 7771

201 302 7772

201 302 7773

201 302 7774